



National Aeronautics and
Space Administration

Principal Center for Regulatory Risk Analysis and Communication

REGULATORY SUMMARY

Proposed Rule

National Emission Standards for Hazardous Air Pollutants for Reciprocating Internal Combustion Engines (RICE)

This information was prepared by NASA's Principal Center for Regulatory Risk Analysis and Communication (RRAC PC). If you have further questions or need assistance with this matter, please contact the RRAC PC Manager, Sharon Scroggins (256-544-7932, sharon.scroggins@nasa.gov).

Introduction

On 5 March 2009, the U.S. Environmental Protection Agency (EPA) published the proposed amendments ([74 FR 9697](#)) to the National Emission Standards for Hazardous Air Pollutants (NESHAP) for stationary reciprocating internal combustion engines (RICE). The rule, when finalized, will set emission limits for RICE located at area sources and major sources of hazardous air pollutants (HAPs). A major source of HAP emissions ("major source") is a stationary source that emits or has the potential to emit any single HAP at a rate of 10 tons or more per year or any combination of HAPs at a rate of 25 tons or more per year. An area source of HAP emissions ("area source") is a source that is not a major source. These proposed requirements potentially apply to any facility that owns or operates stationary RICE.

EPA will accept comments on this proposed rule through 4 May 2009, or 30 days after the date of the public hearing, if requested. If a hearing is requested by 25 March 2009, it will be held on 6 April 2009. The schedule for completing this rule is part of a consent decree that requires EPA to complete a final rule by 10 February 2010.

Summary of the Proposed Rule

EPA promulgated the NESHAP for existing, new, and reconstructed stationary RICE >500 horsepower (hp) located at major sources of HAP on 15 June 2004. On 18 January 2008, EPA promulgated the NESHAP for new and reconstructed stationary RICE located at area sources and for new and reconstructed stationary RICE that have a site rating of ≤500 hp located at

major sources. The proposed amendments would revise 40 *Code of Federal Regulations* (CFR) Part 63, Subpart ZZZZ, to address HAP emissions from the following stationary RICE:

- Existing stationary RICE with a site rating of ≤ 500 hp located at major sources. For this category, a stationary RICE is considered existing if construction or reconstruction began before 12 June 2006.
- Existing stationary RICE of any power rating located at area sources. For this category, a stationary RICE is considered existing if construction or reconstruction began before 12 June 2006.
- Existing non-emergency compression ignition (CI) engines with a site rating > 500 hp at major sources. For this category, a stationary RICE is existing if construction or reconstruction of the stationary RICE began before 19 December 2002.

In addition, EPA is proposing to amend the previously promulgated regulations regarding operation of stationary RICE at major sources during periods of startup, shutdown and malfunction. This proposed change includes new and reconstructed non-emergency two-stroke lean burn (2SLB) and CI stationary RICE > 500 hp, new and reconstructed non-emergency four-stroke lean burn (4SLB) stationary RICE ≥ 250 hp, and existing four-stroke rich burn (4SRB) stationary RICE > 500 hp.

EPA is proposing to limit HAP emissions by establishing emissions standards for formaldehyde at major and area sources for non-emergency 4SRB engines, emergency spark ignition (SI) engines, and engines < 50 hp (major sources only); and through emission standards for carbon monoxide (CO) for all other engines.

Proposed Standards

Existing Stationary RICE at Major Sources

Exhibit 1 provides the emission standards for existing stationary RICE located at major sources, as outlined in the proposed rule. Note that EPA also is co-proposing that the same standards apply during both normal operation and periods of startup and malfunctions (Refer to Startup, Shutdown, and Malfunction section below).

EXHIBIT 1
Emission Standards for Existing Stationary RICE Located at Major Sources

Subcategory	Emission Standards at 15 Percent O ₂ (Parts per Million by Volume on a Dry Basis [ppmvd])	
	Except during Periods of Startup or Malfunction	During Periods of Startup or Malfunction
Non-Emergency 2SLB 50 \geq hp \leq 249	85 ppmvd CO	85 ppmvd CO
Non-Emergency 2SLB 250 \geq hp \leq 500	8 ppmvd CO or 90% CO reduction	85 ppmvd CO

Subcategory	Emission Standards at 15 Percent O ₂ (Parts per Million by Volume on a Dry Basis [ppmvd])	
	Except during Periods of Startup or Malfunction	During Periods of Startup or Malfunction
Non-Emergency 4SLB 50≥hp≤249	95 ppmvd CO	95 ppmvd CO
Non-Emergency 4SLB 250≥hp≤500	9 ppmvd CO or 90% CO reduction	95 ppmvd CO
Non-Emergency 4SRB 50≥hp≤500	200 ppbvd formaldehyde or 90% formaldehyde reduction	2 ppmvd formaldehyde
All CI 50≥hp≤300	40 ppmvd CO	40 ppmvd CO
Emergency CI 300>hp≤500	40 ppmvd CO	40 ppmvd CO
Non-Emergency CI >300 hp	4 ppmvd CO or 90% CO reduction	40 ppmvd CO
<50 hp	2 ppmvd formaldehyde	2 ppmvd formaldehyde
Landfill/Digester 50≥hp≤500	177 ppmvd CO	177 ppmvd CO
Emergency SI 50≥hp≤500	2 ppmvd formaldehyde	2 ppmvd formaldehyde

Additionally, certain existing stationary RICE located at major sources are subject to fuel requirements. Owners and operators of existing stationary non-emergency diesel-fueled CI engines >300 hp with a displacement of < 30 liters per cylinder located at major sources must use only diesel fuel that has a maximum sulfur content of 15 parts per million (ppm) and either a minimum cetane index of 40 or a maximum aromatic content of 35 volume percent.

Existing Stationary RICE at Area Sources

Exhibit 2 provides the emission requirements for existing stationary RICE located at area sources, as outlined in the proposed rule. Note that EPA also is co-proposing that the same standards apply during both normal operation and periods of startup and malfunctions (Refer to Startup, Shutdown, and Malfunction section below).

EXHIBIT 2

Emission Standards and Requirements for Existing Stationary RICE Located at Area Sources

Subcategory	Emission Standards at 15 Percent O ₂ (as Applicable) or Management Practice	
	Except during Periods of Startup or Malfunction	During Periods of Startup or Malfunction
Non-Emergency 2SLB 50≥hp≤249	Change oil and filter every 500 hours; replace spark plugs every 1,000 hours; and inspect all hoses and belts every 500 hours and replace as necessary	Change oil and filter every 500 hours; replace spark plugs every 1,000 hours; and inspect all hoses and belts every 500 hours and replace as necessary
Non-Emergency 2SLB hp≥250	8 ppmvd CO or 90% CO reduction	85 ppmvd CO
Non-Emergency 4SLB 50≥hp≤249	Change oil and filter every 500 hours; replace spark plugs every 1,000 hours; and inspect all hoses and belts every 500 hours and replace as necessary	Change oil and filter every 500 hours; replace spark plugs every 1,000 hours; and inspect all hoses and belts every 500 hours and replace as necessary
Non-Emergency 4SLB hp≥250	9 ppmvd CO or 90% CO reduction	95 ppmvd CO
Non-Emergency 4SRB hp≥50	200 ppbvd formaldehyde or 90% formaldehyde reduction	2 ppmvd formaldehyde
Emergency CI 50≥hp≤500	Change oil and filter every 500 hours; inspect air cleaner every 1,000 hours, inspect all hoses and belts every 500 hours and replace as necessary	Change oil and filter every 500 hours; inspect air cleaner every 1,000 hours, inspect all hoses and belts every 500 hours and replace as necessary
Emergency CI hp>500	40 ppmvd CO	40 ppmvd CO
Non-Emergency CI 50≥hp≤300	Change oil and filter every 500 hours; inspect air cleaner every 1,000 hours; and inspect all hoses and belts every 500 hours and replace as necessary	Change oil and filter every 500 hours; replace spark plugs every 1,000 hours; and inspect all hoses and belts every 500 hours and replace as necessary
Non-Emergency CI hp>300	4 ppmvd CO or 90% CO reduction	40 ppmvd CO
hp<50	Change oil and filter every 200 hours; replace spark plugs every 500 hours; and inspect all hoses and belts every 500 hours and replace as necessary	Change oil and filter every 200 hours; replace spark plugs every 500 hours; and inspect all hoses and belts every 500 hours and replace as necessary
Landfill/Digester Gas 50≥hp≤500	Change oil and filter every 500 hours; replace spark plugs every 1,000 hours; and inspect all hoses and belts every 500 hours and replace as necessary	Change oil and filter every 500 hours; replace spark plugs every 1,000 hours; and inspect all hoses and belts every 500 hours and replace as necessary

Subcategory	Emission Standards at 15 Percent O ₂ (as Applicable) or Management Practice	
	Except during Periods of Startup or Malfunction	During Periods of Startup or Malfunction
Landfill/Digester Gas hp>500	177 ppmvd CO	177 ppmvd CO
Emergency SI 50≥hp≤500	Change oil and filter every 500 hours; replace spark plugs every 1,000 hours; and	Change oil and filter every 500 hours; replace spark plugs every 1,000 hours; and inspect all hoses and belts every 500 hours and replace as necessary
Emergency SI hp>500	2 ppmvd formaldehyde	2 ppmvd formaldehyde

Additionally, owners and operators of existing stationary non-emergency diesel-fueled CI RICE > 300 hp with a displacement of <30 liters per cylinder located at area sources must only use diesel fuel that has a maximum sulfur content of 15 ppm and either a minimum cetane index of 40 or a maximum aromatic content of 35 volume percent.

Amendments to Existing Regulations for New or Reconstructed Stationary RICE

Exhibit 3 provides the emission limitations for new or reconstructed stationary RICE >500 hp at major sources, new or reconstructed 4SLB stationary RICE ≥ 250 hp at major sources and existing 4SRB stationary RICE >500 hp at major sources during periods of startup and malfunction, as outlined in the proposed rule. Note that EPA also is co-proposing that the same standards apply during both normal operation and periods of startup and malfunctions (Refer to Startup, Shutdown, and Malfunction section below).

EXHIBIT 3

Emission Standards for New or Reconstructed Non-Emergency Stationary RICE >500 hp at Major Sources and Existing Non-Emergency 4SRB Stationary RICE >500 hp at Major Sources during Periods of Startup or Malfunction

Subcategory	Emission Standards at 15 Percent O ₂
New or reconstructed non-emergency 2SLB >500 hp located at a major source of HAP emissions	Limit concentration of CO in the stationary RICE exhaust to 259 ppmvd or <15 percent O ₂ during periods of startup or malfunction.
New or reconstructed non-emergency 4SLB ≥ 250 hp located at a major source of HAP emissions	Limit concentration of CO in the stationary RICE exhaust to 420 ppmvd or <15 percent O ₂ during periods of startup or malfunction.
Existing non-emergency 4SRB >500 hp located at a major source of HAP emissions; or New or reconstructed non-emergency 4SRB >500 hp located at a major source of HAP emissions	Limit concentration of formaldehyde in the stationary RICE exhaust to 2 ppmvd or <15 percent O ₂ during periods of startup or malfunction.
New or reconstructed non-emergency CI >500 hp located at a major source of HAP emissions	Limit concentration of CO in the stationary RICE exhaust to 77 ppmvd or <15 percent O ₂ during periods of startup or malfunction.

Startup, Shutdown, and Malfunction Limits

EPA is proposing that the same standards apply during both normal operation and periods of shutdown because EPA does not believe that emissions should be different during periods of shutdown compared to normal operations. Please note that for engines located at major sources and engines >500 hp located at area sources, the standards for normal operation were promulgated in previous amendments. Exhibits 1 and 2 outline the emission standards during normal operation for some of the engines at major and area sources.

EPA is co-proposing the following two options during periods of startup and malfunction for subcategories for which the proposed emission standard is based on the use of catalytic controls such as Oxidation Catalysts (OC) and Non Selective Catalytic Reduction (NSCR):

Option 1: Having the same standards apply during both normal operation and periods of startup and malfunctions.

Option 2: Setting forth proposed standards (as listed in Exhibits 1, 2, and 3) using the approach of differentiating between periods of startup and malfunction and normal operations.

EPA has requested comments regarding these proposed options and approaches. EPA also is proposing the same emission limitations during startup and malfunction as during periods of normal operation for the subcategories of stationary RICE where the proposed emission limitations during normal operation are not based on the use of OC or NSCR.

Also, EPA notes that an approach that sets a single maximum achievable control technology (MACT) standard that applies at all times, including startup, shutdown, and malfunction periods, may result in a higher overall MACT standard, based on the need to account for variation of operations. EPA has requested comments about other approaches to setting MACT standards during periods of startup, shutdown, and malfunction. EPA also has requested comments regarding the level of specificity needed to define the periods of startup and malfunction.

Operating Limitations

Exhibit 4 provides the operating limitations for existing stationary non-emergency 2SLB, 4SLB, 4SRB, and CI RICE that are > 500 hp and located at an area source, and for existing stationary non-emergency CI RICE that are > 500 hp and are located at a major source.

EXHIBIT 4
Operating Limitations

For Each...	You Must Meet the Following Operating Limitation...
Existing stationary non-emergency 2SLB, 4SLB, and CI RICE that are >500 hp and are located at an area source, and existing stationary non-emergency CI RICE that are >500 hp and are located at a major source complying with the proposed requirements and using an Oxidation Catalyst	<p>a. Maintain the catalyst so that the pressure drop across the catalyst does not change by more than 2 inches of water from the pressure drop across the catalyst that was measured during the initial performance test.</p> <p>b. Maintain the temperature of the stationary RICE exhaust so that the catalyst inlet temperature is between 450 and 1350 degrees Fahrenheit (°F).</p>

For Each...	You Must Meet the Following Operating Limitation...
Existing stationary non-emergency 2SLB, 4SLB, and CI RICE that are > 500 hp and are located at an area source, and existing stationary non-emergency CI RICE that are >500 hp and are located at a major source complying with the proposed requirements and not using an Oxidation Catalyst	Comply with any operating limitations approved by the Administrator.
Existing stationary non-emergency 4SRB RICE that are > 500 hp and are located at an area source complying with the proposed requirements and using NCSR	a. Maintain the catalyst so that the pressure drop across the catalyst does not change by more than 2 inches of water from the pressure drop across the catalyst that was measured during the initial performance test. b. Maintain the temperature of the stationary RICE exhaust so that the catalyst inlet temperature is between 750 and 1250 °F.
Existing stationary non-emergency 4SRB RICE that are >500 hp and are located at an area source complying with the proposed requirements and not using NCSR	Comply with any operating limitations approved by the Administrator.

Demonstrating Compliance

Existing Stationary RICE at Major Sources

Exhibit 5 provides the requirements for demonstrating compliance, as outlined in the proposed rule for existing stationary RICE located at major sources.

EXHIBIT 5

Requirements for Demonstrating Compliance for Existing Stationary RICE Located at Major Sources

Subcategory	To Demonstrate Compliance, Owners or Operators...
- Non-Emergency RICE 100 hp - Emergency RICE	a. Must operate and maintain stationary RICE and aftertreatment control device (if any) according to the manufacturer's emission-related written instructions or develop own maintenance plan. b. Do not have to conduct performance testing.
Non-Emergency RICE 100≥hp≤500	Must conduct an initial performance test to demonstrate that they are achieving the required emission standards.
Non-Emergency RICE >500 hp	Must conduct an initial performance test and test every 8,760 hours of operation or 3 years, whichever comes first, to demonstrate that they are achieving the required emission standards.
Non-Emergency CI RICE >500 hp	a. Must continuously monitor and record the catalyst inlet temperature if an oxidation catalyst is being used. b. Must measure the pressure drop across the catalyst monthly. c. Must continuously monitor and record the operating parameters (if any) approved by the Administrator if an oxidation catalyst is not being used.

Existing Stationary RICE at Area Sources

Exhibit 6 provides requirements for demonstrating compliance, as outlined in the proposed rule for existing stationary RICE located at area sources.

EXHIBIT 6

Requirements for Demonstrating Compliance for Existing Stationary RICE Located at Area Sources

Subcategory	To Demonstrate Compliance, Owners or Operators...
RICE subject to management practices as determined from Exhibit 2	a. Must develop a maintenance plan that specifies how the management practices will be met. b. Do not have to conduct any performance testing.
RICE subject to numerical emission standards as determined from Exhibit 2	Must conduct an initial performance test to demonstrate that they are achieving the required emission standards.
Non-Emergency RICE >500 hp	Must conduct an initial performance test and must test every 8,760 hours of operation or 3 years, whichever comes first, to demonstrate that they are achieving the required emission standards.
Non-emergency 2SLB, 4SLB, 4SRB, and CI RICE >500 hp	a. Must continuously monitor and record the catalyst inlet temperature if an oxidation catalyst or NSCR is being used. b. Must measure the pressure drop across the catalyst monthly. c. Must continuously monitor and record the operating parameters (if any) approved by the Administrator if an oxidation catalyst or NSCR is not being used.

Aftertreatment Control Options

This proposed rule establishes emission limits on existing RICE that owners and operators can meet by installing the following aftertreatment controls:

- NSCR: EPA expects that owners or operators of existing “rich burn” engines, which burn natural gas, gasoline, or other fuels, would install an NSCR device to meet the proposed limits. This technology uses catalytic material to reduce some pollutants such as nitrogen oxide (NO_x), while also oxidizing other pollutants such as CO, HAPs, and volatile organic compounds (VOCs).
- OC: This technology can be applied either to diesel- or natural gas-fired “lean burn” engines. OCs achieve significant reductions in HAP and CO emissions. They also achieve some particulate matter (PM) reduction in diesel-fired engines. However, they provide negligible reductions of soot (black carbon).
- Catalyzed diesel particulate filters (CDPF): CDPF significantly can reduce PM, HAPs, and CO in diesel-fired engines. This technology also is effective at reducing diesel soot (black carbon) at > 90 percent.

Applicability to NASA

The proposed RICE NESHAP will apply to existing stationary RICE operated onsite at NASA Centers, as well as offsite at contractor and vendor facilities that are major and area sources of HAP emissions. NASA stakeholders are advised to review this proposal to identify potential

adverse impacts, and should note that it *does not* include a specific exemption for space vehicle-related operations.

These rules have not yet been finalized. Any potential issues or adverse impacts to NASA Centers or Programs should be identified immediately to Sharon Scroggins (256-544-7932, sharon.scroggins@nasa.gov) to facilitate the preparation and submittal of comments to EPA.